

CLOUD COMPUTING

Programme Structure

Course Code	Course Title	Lecture (L) Hours Per Week	Tutorial (T) Hours Per Week	Practical (P) Hours Per Week	Total Credits
CSE2353	Computer Networks	3	-	-	3
CSE2453	Distributed System	3	-	-	3
CSE2553	High Performance Computing	3	-	-	3
CSE2653	Information Storage Management	3	-	-	3
CSE2753	Interfacing with Virtualization	3	-	-	3
CSE2853	Cloud Computing Tools & Techniques	3	-	-	3
	TOTAL				18

CLOUD COMPUTING

Syllabus

COMPUTER NETWORKS

Course Code: CSE2353

Credit Units: 03

Course Objective:

The course provides a unified and fundamental view of the broad field of computer networks. Furthermore, the easy to understand and extremely relevant world of Computer Networking is introduced in a top down Approach. Introduction to intranets and intranet servers and browsers, networks and network servers, LANs/WANs, internetworking technologies, the OSI reference model for networking protocols, CSMA/CD, TCP/IP implementation

Course Contents:

Module I: Introduction

Introduction to computer networks, evolution of computer networks and its uses, Advantages and Disadvantages of Computer Network, reference models: OSI reference Models, TCP/IP Protocol Suit Networking fundamentals: Internet, Circuit switching vs Packet switching, ISPs, Delay and Loss in Packet Switched Networks

Module II: Local Area Network

LAN Architecture, LAN topologies- Bus/ Tree LAN, Ring LAN, Star LAN, Wireless LAN, Ethernet and Fast Ethernet, Token Ring

Module III: Application layer and data link layer

Application Layer Protocols: HTTP, FTP, SMTP, DNS

Data link layer design issues, Flow Control- Stop and Wait, Error Detection, Error Control, error detection and correction, data link layer protocols, sliding window protocols, example of data link protocol- HDLC

Module IV: Medium access layer

Channel allocation problem, multiple access protocols, Introduction to ALOHA, CSMA/CD, CSMA/CA

Module V: The network layer

Introduction, Routers, Network layer concepts, shortest path routing, flooding, distance vector routing, link state routing (without algorithms), congestion control and quality of service, internetworking, IP, Ipv4 Addressing vs Ipv6

Module VI: The transport layer

The transport layer services, elements of transport protocols, TCP and UDP, Brief introduction to presentation and session layer, E-mail

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

CT: Class Test, HA: Home Assignment, S/V/Q: Seminar/Viva/Quiz, EE: End Semester Examination;
Att: Attendance

Text & References:

Text:

- Data Communication & networking: Forouzan, B. A.
- Data and Computer Communications, W. Stallings, Prentice Hall of India

References:

- Computer Networks: Tanenbaum, Andrew S, Prentice Hall

DISTRIBUTED SYSTEM

Course Code: CSE2453

Credit Unit: 03

Course Objective:

It serves as one of the important courses in terms of having an understanding about the basic concepts about distributed systems, their types or categories with some concepts about basic networking and various different directions in which it is useful and applicable. The outcome of the course implicitly and explicitly affects the abilities of students to have a good understanding of the upcoming other related courses.

Course Contents:

Module 1: Introduction to Distributed System

Introduction, Goals of Distributed System Examples of distributed systems , Trends in distributed systems , Resource sharing in distributed system, Challenges faced, System Models basics, types of System Models, Physical models , Architectural models , Fundamental models.

Module 2: Networking and Internetworking

Introduction to networking, Networking issues for distributed systems, Types of network (LAN, MAN, WAN, WLAN, WMAN, WWAN, internetworks), Network principles, Internet protocols, Basics of Inter-Process communication, Multicast Communication, Network virtualization: overlay networks, Remote invocation, Remote Procedure Call, Remote method invocation.

Module 3: Operating System Support, Web Services and Security

Introduction , Operating System layer, Operating System Architecture, Virtualization at Operating System level, Introduction to web services, Service descriptions and IDL for web services, Applications of web services, Overview of Security Techniques, Cryptographic algorithms , Digital signatures, Needham–Schroeder, Kerberos techniques.

Module 4: Distributed File Systems and Distributed Transactions

Introduction (URI, URL's) , Name services and the Domain Name System(NameSpace, Name Resolution, DNS), Directory services, Transactions , Nested transactions , Locks , Optimistic concurrency control, Flat and nested distributed transactions , Atomic commit protocols , Concurrency control in distributed transactions , Distributed deadlocks.

Module 5: Distributed Multimedia System and Distributed Algorithms

Characteristics of multimedia data, Quality of service management, Resource management, Stream adaptation, Introduction to communication protocols, Balanced sliding window protocol, Routing algorithms, Destination based routing, APP problem, Deadlock free Packet switching.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:

Text:

- Coulouris, Dollimore, Kindberg, Blair, "Distributed System: Concepts and Design", Fifth Edition, Pearson Ed.
- Singhal & Shivaratri, "Advanced Concept in Operating Systems", McGraw Hill

References:

- Andrew S. Tanenbaum, "Computer Networks", 4th ed., Prentice Hall
- Gerald Tel, "Distributed Algorithms", Cambridge University Press

HIGH PERFORMANCE COMPUTING

Course Code: CSE2553

Credit Units: 03

Course Objective:

This course gives an insight about Cluster and Grid computing. The major objective of this course is to provide a sound foundation to the students on the concepts, percepts and practices in a field that is of immense concern to the industry and business. This would be helpful to students for understanding a subject related to but a bit higher in its hierarchy.

Course Contents:

Module 1: Parallel and Distributed Programming Models

Introduction to high performance computing, basic definitions: cluster, grid, meta-computing, middleware etc., examples of representative applications. Programming models: shared memory, message passing, peer-to-peer. Development of parallel and distributed applications, Design phases, Common parallel patterns, Performance metrics and profiling.

Module 2: Overview of Cluster Computing

The Role of Clusters, Definition and Taxonomy, Distributed Computing, Limitations, Architecture of cluster-based systems, Design Decisions, Network Hardware, Network Software, Protocols Distributed File Systems, Virtualization technologies, Issues in cluster design: performance, single-system-image, fault tolerance, manageability, programmability, load balancing, security, storage.

Module 3: Introduction of Grid Computing

Introduction, Evolution of the Grid, Definitions of Grid Computing, Infrastructure of hardware and software, Grid models, Applications, Examples of usage, Research possibilities / scope in Grid Computing, HPC and Grids, Scheduling HPC applications in Grids, Grid Monitoring Architecture (GMA) – An Overview of Grid Monitoring Systems.

Module 4: Integrating task parallelism with data parallelism

Introduction and motivation, A model for integrating task parallelism into data parallel programming platforms, Integration of the model into ARC, Design and implementation applications, performance analysis, guidelines for composing user programs, related work.

Anonymous remote computing and communication model: Introduction, Location in dependent inter task communication with DP, DP model of iterative grid computations, Design and implementation of distributed pipes.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:

Text:

- “Grid Computing a Research Monograph” by D. Janakiram, Tata McGraw hill publications

References:

- Joshy Joseph & Craig Fellenstein, “Grid Computing”, Pearson Education
- “Grid Computing: A Practical Guide to technology and Applications” by Ahmar Abbas, Charles River media

INFORMATION STORAGE MANAGEMENT

Course Code: CSE2653

Credit Units: 03

Course Objective:

The course provides detailed knowledge, practical training and insight into the implementation and management of various storage technologies with a focus towards applying these technologies in an information lifecycle paradigm. This course focuses on evolution of storage and implementation models, Storage devices principles, Storage classes (SAN, NAS, CAS) and Backup, Business Continuity, and Disaster Recovery principles

Course Contents:

Module 1: Introduction to Storage Technology

Information Storage - Data, Types of Data, Information, Storage, Evolution of Storage Technology and Architecture, Data Center Infrastructure, Key Challenges in Managing Information, Information Lifecycle -Information Lifecycle Management, ILM Implementation, ILM Benefits.

Module 2: Data Protection & Intelligent Storage System

Components of a Storage System Environment, RAID -Implementation of RAID, RAID Array Components, RAID levels, RAID Impact on Disk Performance, Components of an Intelligent Storage System, Intelligent Storage Array-High-end Storage Systems, Midrange Storage System

Module 3: Storage Networking Technologies & Virtualization

Direct-Attached Storage and Introduction to SCSI- Types of DAS, DAS Benefits and Limitations, Disk Drive Interfaces, Introduction to Parallel SCSI, Storage Area Networks- Fibre Channel: Overview, SAN and its evolution, Components of SAN, Network-Attached Storage- General Purpose Servers vs. NAS Devices, Benefits of NAS, Components of NAS.

Module 4: CAS and Business Continuity

CAS: Fixed Content and Archives, Types of Archives, Features and Benefits of CAS, CAS Architecture, Object Storage and Retrieval in CAS.

Introduction to Business Continuity: Information Availability, BC Terminology, BC Planning Lifecycle, Failure Analysis.

Module 5: Backup, Recovery & Replication

Backup and Recovery : Backup Purpose, Backup Considerations, Backup Granularity, Recovery Considerations, Backup Methods, Backup Process, Backup and Restore Operations, Backup Topologies, Backup Technologies.

Replication: Local Replication- Uses of Local Replicas, Data Consistency, Local Replication Technologies, Remote Replication- Modes of Remote Replication, Remote Replication Technologies.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:

Text:

- Information Storage and Management, Wiley Publication ISBN: 978-81-265-2147-0

References:

- Marc Farley Osborne, "Building Storage Networks", Tata McGraw Hill
- Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill

INTERFACING WITH VIRTUALIZATION

Course Code: CSE2753

Credit Units: 03

Course Objective:

This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

Course Contents:

Module-I: Introduction to Virtualization

Virtualization and cloud computing - Need of virtualization – cost, administration, fast deployment, reduce infrastructure cost – limitations

Types of hardware virtualization: Full virtualization - partial virtualization - para virtualization

Desktop virtualization: Software virtualization – Memory virtualization - Storage virtualization – Data virtualization – Network virtualization

Module-II: Hypervisors and Virtual machines

Server Virtualization: Understanding Server Virtualization, types of server virtualization, Virtual machine basics, types of virtual machines, hypervisor concepts and types

Module-III: Virtualization Solutions

Understanding Microsoft's Virtualization solutions: Microsoft's Infrastructure Optimization Model, Virtualization and the Infrastructure Optimization Model, Benefits of Virtualization, Achieving the Benefits of Datacenter Virtualization, Achieving the Benefits of Client Virtualization, Achieving the Benefits of Cloud Virtualization

Module-IV: Migrating into a Cloud

Introduction, Challenges while migrating to Cloud, Broad approaches to migrating into the cloud- why migrate -deciding on cloud migration, the Seven-step model of migration into a cloud, Migration Risks and Mitigation, Enterprise cloud computing paradigm, relevant Deployment Models for Enterprise Cloud Computing, Adoption and Consumption Strategies, issues for enterprise applications on the cloud

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:

Text:

- David Marshall, Wade A. Reynolds, Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach
- Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

References:

- Publications, 2006. Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
- Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010

CLLOUD COMPUTING TOOLS AND TECHNIQUES

Course Code: CSE2853

Credit Units: 03

Course Objective:

This course gives students an insight into the basics of cloud computing along with virtualization, cloud computing is one of the fastest growing domain from a while now. It will provide the students basic understanding about cloud and virtualization along with it how one can migrate over it.

Course Contents:

Module-I: Cloud Computing Overview

Origins of Cloud computing – Cloud components - Essential characteristics – On-demand self-service, Broad network access, Location independent resource pooling ,Rapid elasticity , Measured service, Comparing cloud providers with traditional IT service providers, Roots of cloud computing.

Module-II: Cloud Insights

Architectural influences – High-performance computing, Utility and Enterprise grid computing, Cloud scenarios – Benefits: scalability ,simplicity ,vendors ,security, Limitations – Sensitive information - Application development- security level of third party - security benefits, Regularity issues: Government policies.

Module-III: Cloud Architecture- Layers and Models

Layers in cloud architecture, Software as a Service (SaaS), features of SaaS and benefits, Platform as a Service (PaaS), features of PaaS and benefits, Infrastructure as a Service (IaaS), features of IaaS and benefits, Service providers, challenges and risks in cloud adoption.

Cloud deployment model: Public clouds – Private clouds – Community clouds - Hybrid clouds - Advantages of Cloud computing.

Module-IV: Cloud Simulators- CloudSim and GreenCloud

Introduction to Simulator, understanding CloudSim simulator, CloudSim Architecture(User code, CloudSim, GridSim, SimJava) Understanding Working platform for CloudSim, Introduction to GreenCloud

Module-V: Introduction to VMWare Simulator

Basics of VMWare, advantages of VMware virtualization, using VMware workstation, creating virtual machines-understanding virtual machines, create a new virtual machine on local host, cloning virtual machines, virtualize a physical machine, starting and stopping a virtual machine.

Examination Scheme:

Components	A	CT	S/V/Q	HA	EE
Weightage (%)	5	10	8	7	70

Text & References:

Text:

- Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
- Cloud Computing: Web-Based Applications That Change the Way You Work and Collaborate Online - Michael Miller - Que 2008

References:

- Cloud computing for dummies- Judith Hurwitz , Robin Bloor , Marcia Kaufman ,Fern Halper, Wiley Publishing, Inc, 2010
- Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011